

Jin MURATA\*: **New or noteworthy chromosome records  
in *Arisaema* (Araceae) (2)\*\***

邑田仁\*: テンナンショウ属の染色体数に関する新知見 (2)

This study supplements a previous report (Murata & Iijima 1983) on chromosome numbers in the genus *Arisaema*. Chromosome numbers of the following ten species in four sections were determined: *Arisaema filiforme*, *A. grapsospadix*, *A. pingbianense* (sect. Fimbriata); *A. heterophyllum* (sect. Tortuosa); *A. costatum*, *A. galeatum* (sect. Trisecta); *A. lobatum*, *A. minamitanii*, *A. ovale* and *A. sachalinense* (sect. Pedatisecta). The results are compared with those of previous reports and are discussed for each of the sections. Some of the chromosome numbers reported in this study were previously enumerated in the list presented at the XIV International Botanical Congress, Berlin, and were cited in Petersen (1989) as "Murata in Hotta & Murata (1987)", for which original data are given in this paper for the first time.

**Materials and methods** Root tips of *Arisaema sachalinense* were collected at the natural habitat in the field. For other species, root tips were obtained from plants cultivated in the Botanical Gardens, Faculty of Science, The University of Tokyo. After pretreatment with 0.2% colchicine for 4 hours at room temperature, root tips were fixed in a 1:1:1 mixture of absolute alcohol, glacial acetic acid and chloroform. They were then macerated in 1N HCl, stained with Schiff's solution and squashed. Voucher specimens are kept in the Herbarium, Botanical Gardens, Faculty of Science, The University of Tokyo (TI).

**Observations** (chromosome numbers with asterisks were cited in Petersen (1989)).

(1) Sect. Fimbriata Engler

*Arisaema filiforme* Blume.  $2n=28^*$  (Fig. 1b). Voucher specimen: J. Murata 25616, Indonesia, W. Java, Mt. Gede (cult. in Bot. Gard.), Feb. 29, 1988.

*Arisaema grapsospadix* Hayata.  $2n=28$  (Fig. 1a). Voucher specimen: J.

\* Botanical Gardens, Faculty of Science, The University of Tokyo, 3-7-1 Hakusan, Bunkyo-ku, Tokyo 112. 東京大学 理学部附属植物園.

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Murata 27028, Taiwan, Kaohsiung County, Tengchu (cult. in Bot. Gard.), Mar. 15, 1987.

*Arisaema pingbianense* H. Li.  $2n=28$ . Voucher specimen: J. Murata 25619, Thailand, Doi Inthorn, 1700 m, Oct. 10, 1985 (cult. in Bot. Gard.).

The chromosome numbers of the three species above are determined for the first time.

(2) Sect. *Trisecta* Schott ex Engler

*Arisaema galeatum* N.E. Brown.  $2n=26$  (Fig. 1f). Voucher specimen: J. Murata 27026, Bhutan (cult. in Bot. Gard.), Apr. 27, 1987.

*Arisaema costatum* (Wall.) Mart.  $2n=20$ . Voucher specimen: J. Murata 27024, Nepal. Shopuri Ridge, 8000ft, (cult. in Bot. Gard.), Sept. 7, 1988.

The chromosome number of *A. galeatum* is determined for the first time. The lowest chromosome number hitherto known in *Arisaema*,  $2n=20$ , reported for *A. costatum* by Kurosawa (1977), was reconfirmed in this study.

(3) Sect. *Tortuosa* Engler

*Arisaema heterophyllum* Blume.  $2n=28^*$ . Voucher specimen: J. Murata 27023, Taiwan, Jilung City (cult. in Bot. Gard.), Apr. 15, 1986.  $2n=84^{1)}$ . Voucher specimen: Y. Endo 2324, Taiwan, Hsinchu County, Hsinchu City, Lake Chingzao-hu, lakeside, alt. ca. 100 m, Mar. 31, 1984 (TUS).  $2n=168$ . Voucher specimen: J. Murata & Im 16237, Korea, Gyunggi-do, Gwangreung, 120 m, May 26-27, 1984.

*Arisaema heterophyllum* is distributed widely in Japan, Korea, mainland China and Taiwan. In this study, chromosome numbers of Taiwanese plants are reported for the first time. The numbers  $2n=28$  and  $2n=84$  found in Taiwanese plants are considered to be diploid and hexaploid of the basic number  $X=14$ . The chromosome numbers, sex expression and gross morphology are not constant throughout the distribution range of *A. heterophyllum* but appear to be differentiated geographically (Tab. 1). Diploid plants were found from Sichuan (Murata & Iijima 1983) and Taiwan, China, but have not been found in more northern temperate regions such as in Japan and Korea, where only dodecaploid (or decaploid) plants were reported. A close correlation between the sex of the spadix and ploidy level was recognized. The diploid plants from both mainland China and Taiwan have a female spadix when mature. On the other hand,

<sup>1)</sup> This number was misprinted in "Hotta & Murata (1987)" and subsequently cited in Petersen (1989) as  $2n=64$ .

Tab. 1. Chromosome numbers, morphology and distribution of *Arisaema heterophyllum* Blume.

Chromosome number	2n=28	2n=28	2n=84	2n=140, 168
Report	Murata & Iijima (1983)	present study	present study	Ito (1942), Toh (1975, 1982), Murata & Iijima (1983), Ko & Kim (1985), present study
Localities	Mainland China (Mt. Omei)	Taiwan (Jilung)	Taiwan (Hsinchu)	Japan, Korea
Sex of spadix when mature	female	female	?	monoecious
Shape of Spathe-blade	ovate to oblong, gradually narrowed to the base	broadly ovate, abruptly narrowed to the base	broadly ovate, abruptly narrowed to the base	broadly ovate, abruptly narrowed to the base
Numbers of Sterile flowers on male spadix	many	few	?	none

dodecaploid or decaploid plants from Japan and Korea commonly have a monoecious spadix when mature; female specimens have never been collected from these two countries. Sex expression of hexaploid plants from Hsinchu, Taiwan, has not been checked.

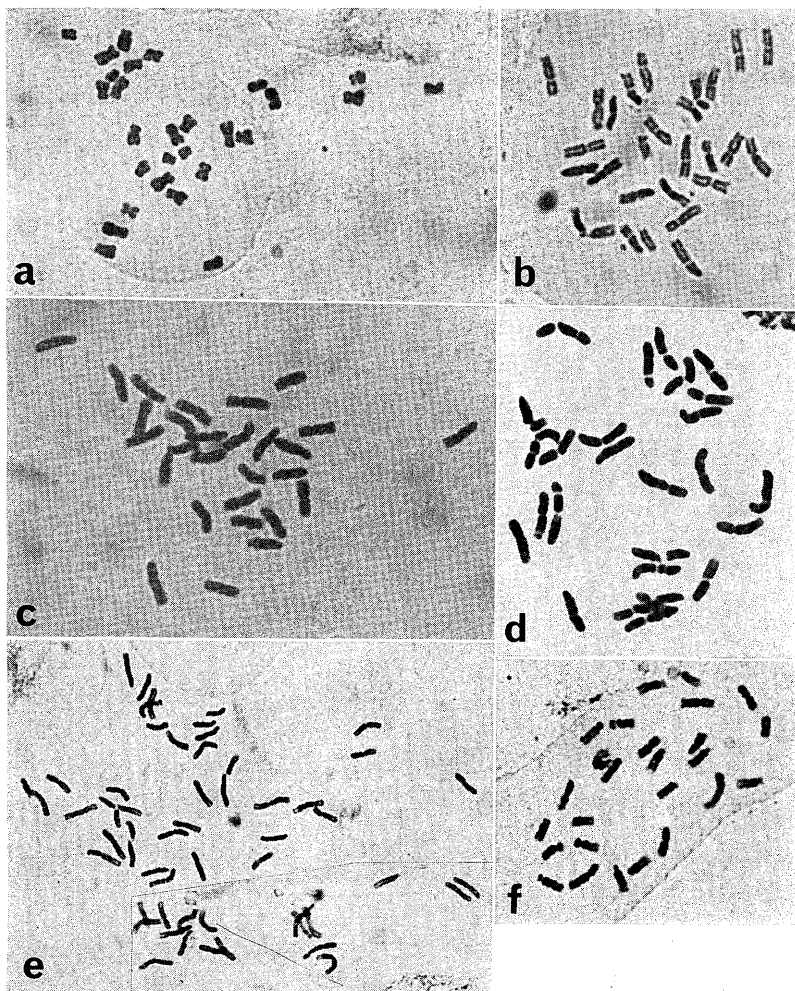


Fig. 1. Somatic chromosomes of *Arisaema* ( $\times 1000$ ). a. *A. grapsospadix* (J. Murata 27028,  $2n=28$ ). b. *A. filiforme* (J. Murata 25616,  $2n=28$ ). c. *A. lobatum* (J. Murata s.n.  $2n=28$ ). d. *A. ovale* var. *sadoense* (J. Murata 8142,  $2n=26$ ). e. *A. amurense* (J. Murata 27004,  $2n=56$ ). f. *A. galeatum* (J. Murata 27026,  $2n=26$ ).

It is notable that differentiation in morphology occurs in this species at the diploid level. Plants from Mt. Omei, Sichuan, China, have a spathe-blade that is broadly ovate and abruptly constricted to the base and there are many horn-like sterile flowers above the female flowers, while plants from Jilung, Taiwan, have a spathe-blade that is ovate and gradually constricted to the base and there are few horn-like sterile flowers above the female flowers. Apart from the sex expression, the morphology of the latter type is very similar to that in the polyploid plants. Extensive morphological and cytological studies covering the whole range of distribution of the species are necessary to obtain a better understanding of the differentiation in *A. heterophyllum*.

(4) Sect. *Pedatisecta* Schott

*Arisaema lobatum* Engler.  $2n=28$  (Fig. 1c). Voucher specimen: J. Murata 17946, China, Sichuan, Mt. Omei (cult. in Bot. Gard), May. 4, 1985.  $2n=ca. 84$ . Voucher specimen. J. Murata s.n., China, Sichuan, Mt. Omei (cult. in Bot. Gard.), May 22, 1985.

*Arisaema sachalinense* (Miyabe et Kudo) J. Murata.  $2n=56$  (Fig. 2b). Voucher specimen: J. Murata 27013, 27014, 17016, Japan, Hokkaido, Rebun Is., Jun. 2, 1986.

*Arisaema ovale* Nakai var. *sadoense* (Nakai) J. Murata.  $2n=26$  (Fig. 1d). Voucher specimen: J. Murata 8142, Japan, Shizuoka Pref., Abetoge (cult. in Bot. Gard.), Jun. 18, 1979.  $2n=65$  (Fig. 2a). Voucher specimen: J. Murata 27006, Japan, Hokkaido, Jozankei (cult. in Bot. Gard.), May 7, 1988.  $2n=65$ . Voucher specimen: J. Murata 27005,

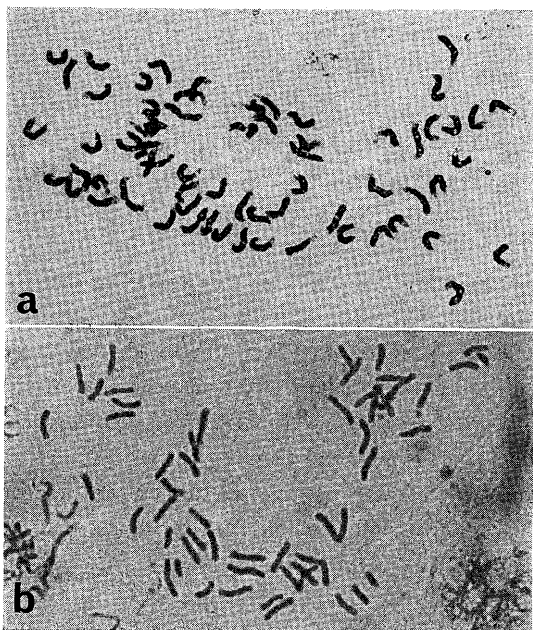


Fig. 2. Somatic chromosomes of *Arisaema* ( $\times 1000$ ). a. *A. ovale* var. *sadoense* (J. Murata 27006,  $2n=65$ ). b. *A. sachalinense* (J. Murata 27013,  $2n=56$ ).

Japan, Hokkaido, Mt. Ohirayama (cult. in Bot. Gard.), May 7, 1988.  $2n=65$ . Voucher specimen: J. Murata 27008, Japan, Hokkaido, Yamakoshi-gun, Yagumomachi, Mt. Obokoyama, 300-800 m (cult. in Bot. Gard.), May 7, 1988.

*Arisaema amurense* Maxim.  $2n=56$  (Fig. 1e). Voucher specimen: J. Murata 27004, USSR, seeds from Bot. Gard. Moscow, (cult. in Bot. Gard.), May 7, 1988.

*Arisaema minamitanii* Serizawa.  $2n=28$ , Japan, Kyushu, Miyazaki Pref., Mt. Wanitsukayama (cult. in Bot. Gard.), Apr. 19, 1985.

Chromosome numbers for *A. lobatum*, *A. minamitanii* and *A. sachalinense* are reported for the first time. In *A. lobatum* and *A. ovale*, high polyploidy was observed. In *A. lobatum*, races with both  $2n=28$  and ca. 84 chromosomes were collected on Mt. Omei. This suggests that diploid and polyploid (probably hexaploid) plants occur close to each other or intermixed in *A. lobatum*. In *A. ovale*, geographical differentiation in ploidy level may be explained as follows. As were reported in the previous papers (Hotta 1971, Serizawa 1981, Murata 1983 & 1986), plants of *A. ovale* Nakai (*A. robustum* auct. non Nakai) in Honshu and Kyushu are generally tetraploid ( $2n=52$ ); diploid ( $2n=26$ , Fig. 1d) and triploid plants have been known from very restricted areas in Honshu. In this study, plants of *A. ovale* in Hokkaido were examined for the first time and those from three different localities were all found to have  $2n=65$  chromosomes. Judging from the basic chromosome numbers of the plants in Honshu and Kyushu ( $X=13$ ), the plants of Hokkaido are interpreted to be pentaploid. In spite of such an odd chromosome number, pollen fertility of the voucher specimens is more than 90%. The existence of two fruiting specimens of *A. ovale* in the Herbarium, Hokkaido University (SAP), suggests that sexual reproduction occurs in populations on Hokkaido in addition to vigorous vegetative reproduction by tubercles (as many as 23 tubercles per individual/year were observed).

*Arisaema sachalinense* has been considered to be closer to *A. amurense* than to *A. ovale* on morphological grounds (Murata, 1986). New cytological information obtained by this study of a basic chromosome number of  $X=14$  in *A. sachalinense*, the same as in *A. amurense*, but different from that in *A. ovale* ( $X=13$ ), supports that hypothesis.

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テンナンショウ属植物10種について染色体数を報告する。これらのうち以下の7種, *Arisaema filiforme*, *A. grapsospadix*, *A. pingbianense*, *A. galeatum*, *A. lobatum*, *A. minamitanii*, *A. sachalinense* については初めての報告である。得られた結果と従来発表されている染色体数を比較し, 以下の考察を行なった。

1) マイズルテンナンショウ *A. heterophyllum* には2倍体 ( $2n=28$ ), 6倍体, 12(10)倍体があるが, 2倍体と倍数体では性転換後の性表現が異なり, 2倍体は雌花序を, 倍数体は両性の花序を付ける。また, 2倍体間に地理的な形態の分化が認められた。台湾産の2倍体は倍数体によく似ているのに対し, 中国峨嵋山産の2倍体は仏炎苞の基部

の形が異なり、花序に突起状の退化花を多数生じる点で異なっている (Tab. 1)。

2) *Arisaema lobatum* とヒロハテンナンショウ *A. ovale* var. *sadoense* には倍数体が観察された。後者の場合、従来報告のあった本州・九州産のものは  $X=13$  の 4 倍体、稀に 2 倍体または 3 倍体であるのに対し、新たに観察された北海道産の 3 資料はすべて  $2n=65$  で  $X=13$  の 5 倍体と推定された。

3) カラフトヒロハテンナンショウ *Arisaema sachalinense* は  $2n=56$  で  $X=14$  の 4 倍体と考えられ、本種がヒロハテンナンショウ ( $X=13$ ) よりもアムールテンナンショウ ( $X=14$ ) に近縁であるという外部形態上の結果 (Murata 1986) を支持している。

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□上野益三：『博物学の時代』276 pp. 八坂書房、東京。¥3,000. 本書は 3 部からなり、第 1 部は「だれも書かない博物学」と題し、副題に「近世日本植物学史要」とあり、記事は 100 ページに近い。「肩肘張った形式的な史書を目差すのではな」く、「私の書きたい植物学史を自由な形式で述べたいだけである」という。「原稿は七、八分通りできたが」、突然の博士の逝去で本記事は中断された。しかし博士自身の予定表を拝見すると、その後の記事は博士の他の記事から推測され、一応完成している。第 2 部の「江戸博物学のロマンチズム」他 6 篇は、最後の収録の「関西博物学史散策」以外は書き下しである。第 3 部は荒俣宏氏と河合雅雄氏との対談の 2 篇の再録である。木村は先に本誌第 65 巻第 1 号に上野博士に関する記事を書いたが、その最後で紹介した「楽しみながらやればいい」の記事が本書に再録されている。また、この記事に木村は筆がすべて、「雑録などに書かれた博物史関係の記事を集めて次の三冊の著作があいついで出版された」と書いたが、これは誤で、『草を手にした肖像画』は 29:5、『忘れられた博物学』は 22:0、『博物学の愉しみ』は 16:7 である。この数字の前は書き下しの編数、後の数字は再録の編数である。ここに亡くなられた著者、出版者、読者におわびする次第である。それにしても、昔流に言えば 90 歳での生涯の最後まで筆をとられた上野博士の意力に驚嘆せざるを得ない。

(木村陽二郎)